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Dr. F. G. Novy, professor of bacteriology and director of the hygienic laboratory, University of Michigan, addressed the Cincinnati Research Society, in the surgical amphitheatre of the Cincinnati General Hospital, on May 1, on "Blood Changes and Anaphylaxis," and on May 2, on "Blood Parasites."

At the meeting of the Chemical Society at London, on April 18, the first of the Hugo Müller lectures was delivered by Sir Henry Miers, whose subject was "The Old and the New Mineralogy."

GIRTON COLLEGE, Cambridge, plans to found a fellowship for the encouragement of research in natural science, and especially in botany, as a memorial of Miss Ethel Sargant.

A BRONZE bust of the late Dr. Daniel Giraud Elliot, mammalogist and ornithologist, is installed on the second floor of the American Museum, in the hall devoted to birds of the world. The bust, which is the work of Mr. Chester Beach, is the gift of Miss Margaret Henderson Elliot, daughter of Dr. Elliot.

DR. EPHRAIM FLETCHER INGALS, professor of diseases of the chest, throat and nose in the Rush Medical College, Chicago, and active in medical research and organization, died on April 30, aged seventy years.

DR. ARMAND THEVENIN, of the Sorbonne, known for his work in paleontology, died on March 7, aged forty-eight years. He had been experimenting with poisonous gases and in the course of his work contracted the illness which proved fatal.

MR. W. HAGUE HARRINGTON, one of the best known of the older Canadian entomologists, died on March 13 at Ottawa, Canada, at the age of sixty-six years. Mr. Harrington was born in Nova Scotia, and entered the federal civil service at Ottawa in November, 1870, eventually reaching the rank of superintendent of the Savings Bank Branch. He was one of the founders of the Ottawa Field Naturalists' Club, and at one time was president of the Entomological Society of Ontario. In 1894, he was elected a fellow of the Royal Society of Canada. For many years his main interest in life was entomology, and he brought together

a large collection of Canadian Coleoptera and Hymenoptera. He was a systematist of recognized standing, and was probably the highest authority on Hymenoptera in the Dominion of Canada. He was a striking example of that class of men who have done pioneer work in natural history in Canada and the United States, while pursuing this work as a hobby rather than as a vocation.

UNIVERSITY AND EDUCATIONAL NEWS

THE Kentucky legislature in the session ending on March 15 made a notable change in the laws providing for the support of institutions of higher education. In view of the material increase in the state's property assessment by the tax commission the legislature passed the reapportionment tax bill and gave the university a rate of $1\frac{3}{4}$ cents on each hundred dollars of the assessment. This provision will give the university an increase of \$200,000 annually over the income it has had in previous years. Plans are now under way for a material increase in the teaching staff and the undertaking of extensive repairs in the plant of the university. Olmstead Brothers, of Brookline, Mass., have been employed to work out plans for campus improvements. Due to war conditions, no new buildings will be constructed at present. President McVey, formerly of the University of North Dakota, began his service with the University of Kentucky last September.

ANNOUNCEMENT is made of the completion of the diamond jubilee fund of \$800,000 for the Ohio Wesleyan University.

A NEW chemistry building is to be erected on the campus of the University of North Dakota. The ground has already been broken and contracts for the construction of the building have been let by the State Board of Regents, at a cost of \$62,483.

At a recent meeting of the council of the University College of Wales, Aberystwyth, it was reported that an anonymous donor was prepared to transfer the sum of £10,500 to the college for the purpose of endowing a chair in geography and anthropology. Herbert John

Fleure, who was appointed professor of zoology at the college ten years ago, will now devote all his energies to the department of geography.

DR. R. H. JESSE, JR., head of the department of chemistry at the Montana State University at Missoula, has been appointed dean of men for the institution.

DISCUSSION AND CORRESPONDENCE

ASTIGMATISM AND COMA

PERHAPS the clearest statement of the prevailing theoretical distinction between the five spherical aberrations is that given in the last edition of the *Encyclopedia Britannica* by Dr. Eppenstein of the Zeiss factory.

The differentiation there made between astigmatism and coma is not, however, in strict conformity with the facts. The term "astigmatism" as applied to lenses has always referred to the increasing lack of sharpness in the image towards the edge of the field in an uncorrected or poorly corrected lens system and "coma" to the peculiar radial flare sometimes very evident in the outer portions of the field.

The explanation given in the article just referred to is that astigmatism is the aberration due to obliquity and is therefore fully shown by very narrow bundles of rays, while coma can not be shown at all except with a wide bundle.

This explanation is the result of reasoning from the theory of astigmatism devised by Sturm, who assumed a behavior of oblique rays completely at variance with the facts. By the use of a method developed by the writer it is possible to calculate with strict accuracy the path and focal point of any ray through a lens surface from any point of the field by the use of which it became at once evident that the two foci calculated by Sturm's method locating the position of the two astigmatic surfaces are pure fictions, though this calculation is nevertheless a rough numerical approximation of this aberration. The detail of the new method of calculation will be presented elsewhere.

As a matter of fact only distortion and curvature are independent of the bundle width,

and both coma and astigmatism are increased with increase in the width of the ray bundles, and it is not true, as stated in this article, that coma alone is the result of the width of the ray bundle. This can be very easily proven without recourse to mathematical calculations by the use of a poorly corrected photographic lens, examining the images on the ground glass or making photographs of a grating, using a wide and a narrow stop.

The best known test for astigmatism is the fact that where this aberration is uncorrected one of two crossing lines may be very vague, while the other is sharp and distinct. This is best seen with the wide stop. The effect is usually explained according to the Sturm theory by saying that only one of these lines can be in focus at a time and that either may be brought into focus. If one will shift the ground glass he can easily prove that only radial lines can be sharply focused by an uncorrected lens, and that towards the edge of the field lines at right angles to these radial lines can not be brought into focus at all and are in fact most nearly in focus on the same plane as the radial lines.

When the grating is rotated 90° the lines that were vague may become sharp but only when a line is approximately radial is the effect of astigmatism nullified.

Both astigmatism and coma consist in a longitudinal spreading out of the image produced by the zones of the lens. The radial lines remain sharp because the shifting is radial and the shifted images of a radial line are superimposed, the line remaining sharp because its width is not increased to an appreciable extent.

Instead therefore of making the distinction expressed by Dr. Eppenstein that the features of lateral aberration due to obliquity constitute astigmatism, and that those dependent on difference of zones produce coma, the writer would suggest that the former be defined as the difference of focus produced by the median region of the lens and that of the most distant marginal point while the latter represents the focal difference of the nearest marginal point of the lens.